Superficial Fungal Infections

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Objectives

- List the major categories of fungi that lead to disease states in humans
- Identify the clinical presentation associated with these pathogens and their appropriate work up
- List appropriate therapeutic interventions

Disclosures

- None pertinent to this presentation

- Consultant and/or clinical investigator for several pharmaceutical companies

Classification

- Dermatophytoses
  - Microsporum
  - Epidermophyton
  - Trichophyton
- Yeast species
- Can infect skin, hair or nails based on the ability to obtain nutrition from *keratin*

Dermatophytoses

- Anamorphic fungi
- Colonize keratin; cause host response inflammation via their by-products
- Host response can be mild to severe dependent on the level of skin invasion—typically confined only to keratin
- Abnormalities of immune system can lead to altered host response

Dermatophytes--Genera

- **Epidermophyton** produces only macroconidia, no microconidia and consists of 2 species, one of which is a pathogen.

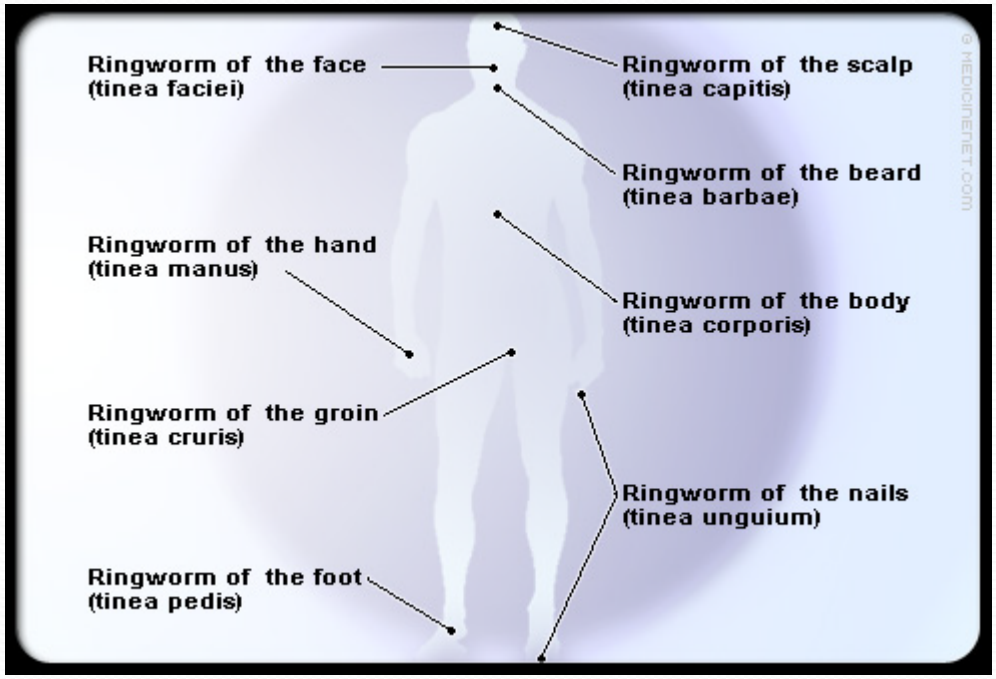
- **Microsporum** - Both microconidia and rough-walled macroconidia characterize Microsporum species. There are 19 described species but only 9 are involved in human or animal infections.

- **Trichophyton** - When produced the macroconidia of Trichophyton species are smooth-walled. There are 22 species, most causing infections in humans or animals.

Dermatophytoses

- Numerous ways to classify
  - Habitat
    - Geophilic
    - Anthropophilic
    - Zoophilic
  - Pattern of infection
  - Degree of host inflammatory response
  - Colony or microscopic appearance
    - Macro- or microconidia
    - Spores

Dermatophytoses



Dermatophytoses

- Diagnostic techniques
  - History and Physical Examination
  - Microscopic examination
    - Tissue scrapings, nail clippings, tissue biopsy, hair mounts
    - KOH or formalin – fixed with special stains
  - Culture
    - Sabouraud's Dextrose Agar (SDA)
    - Dermatophyte Test Media (DTM)
    - Specialized media based on nutritional requirements of the organism in question– ie Trichophyton species

Trichophyton

- Macroconidia are less distinctive and are often absent. Microconidia are more important and their shape, size and arrangement should be noted.

Microsporium

- Macroconidia with rough walls, microconidia may also be present. It is essential to observe macroconidia to make the identification.

Epidermophyton

- Smooth walled macroconidia only found in clusters of two or three, no microconidia, colonies a green-brown to khaki color

Dermatophytoses

- Clinical categories
  - Tinea capitis/favosa/barbae/piedra
  - Tinea corporis/cruris/manum/pedis
  - Onychomycoses
  - Unusual variant: Tinea nigra—Mottled brown-green palmar discoloration of palms; tropical or sub-tropics; dematiaceous fungi
- Broadly:
  - Hair
  - Body
  - Nails

Dermatophytoses

- Tinea capitis
  - Any of the genera Trichophyton or Microsporum *except T. concentricum*
    - Most common worldwide: *M. canis*
    - Most common in United States: *T. tonsurans*
  - Typically, children aged 3-14
  - More common in African-Americans
  - Asymptomatic carriers hard to detect
  - Can be transmitted by fomites
  - Infectious organisms can be harbored for long periods

Dermatophytes: Hair Examination

- Ectothrix:
  - Small or large arthroconidia forming a sheath around the hair shaft
  - Start around perifollicular stratum corneum, then descend into hair shaft and move up the surface replacing cortex keratin
- Endothrix:
  - Arthroconidia within the hair shaft
  - Replace intrapilary keratin and make the hair fragile—prone to breakage—"black dot" pattern
- Fluorescence: Wood's lamp may detect pteridine fluorescence of certain pathogens
  - Ectothrix *M. canis* and *M. audouinii* positive
  - Endothrix *T. tonsurans* negative

Dermatophytoses: Tinea capitis

- Clinical findings depend on the etiology of the tinea: Inflammatory, non-inflammatory, black-dot, favus
- Inflammatory
  - Usually seen with zoophilic or geophilic sources
  - Hypersensitivity reaction
  - Pustules to kerion formation
  - Can result in scarring alopecia
  - May be associated with systemic symptoms: posterior lymphadenopathy/fever/pain
  - Need to treat secondary infection

Dermatophytoses: Tinea capitis

- Non-inflammatory
  - Usually anthropophilic source
  - Prominent scaling but little erythema
  - Hairs may break off above the scalp—may not have overt hair loss
  - May or may not fluoresce
- "Black dot"
  - T. tonsurans and T. violaceum
  - Broken hairs at scalp level give the appearance of black dots
  - Scaling present; inflammation varies

Dermatophytosis: Tinea capitis

- Favus
  - Also known as tinea favosa
  - Chronic infection of the scalp associated with thick, yellow crusts known as scutula
  - Leads to scarring alopecia
  - Associated with malnutrition and poor hygiene; seen almost exclusively in underdeveloped areas
  - *T. schoenleinii* most common

Tinea favosum

Dermatophytoses: Tinea barbae

- Source
  - Used to be seen with contaminated razors in barber shops; now usually direct contract from a zoophilic source—cattle/horses/dogs
    - *T. mentagrophytes*, *T. verrucosum*; rarely *M. canis*
- Unilateral; more often in beard than mustache distribution
- Subtypes
  - Inflammatory: Similar to a kerion; pustule formation
  - Superficial: Small perifollicular papules and pustules
  - Circinate: Active, scaling spreading vesiculopustular border—similar to tinea corporis

Dermatophytes: Tinea corporis

- Transmission from anthropohilic and zoophilic sources predominate; autoinoculation may also occur—i.e. from feet
  - Children and animals common— *M. canis*
  - Wrestlers pron—also for herpes
  - Humid climates, occlusive clothing contribute
  - Tinea imbracata: Variant presenting as concentric rings limited to South/Central America, South Pacific; *T. concentricum* source
  - *T. rubrum, T. mentagrophytes, M. canis, T. tonsurans* common

Dermatophytosis: Tinea corporis

- Clinical presentation
  - Annular lesion with erythema and scale
  - Spreads centrifugally
  - May be vesicular or edematous at margin
  - Polycyclic or psoriasiform
  - Majocchi's granuloma: Deeper, granulomatous papules or plaques, often in women who shave their legs

Dermatophytosis: Tinea cruris

- Coloquially known as “jock itch”
- “Cruris” is Latin for “of the leg;” may also be seen on mons, buttocks, genitalia
- More common in men
- Exacerbated by warm, moist clothing; adults greater than children
- *T. rubrum* and *E. floccosum* most common
- Anthropohilic; auto-inoculation from resrvoir
- Well-demarcated erythematous plaques with scale and an active border

Dermatophytosis: Tinea manum/pedis

- Hands and feet
- Worldwide prevalence; most common dermatophytosis; tinea pedis 10%
  - Occlusive footwear
  - Communal baths/showers
- *T. rubrum, T. mentagrophytes, E. floccosum*
- Interdigital maceration on feet, scale of plantar surface, odor
- Hands with fine scale; hands or feet with bullae
- “Two-feet, one-hand” syndrome

Dermatophytoses: Onychomycoses

- Onycomycosis: Any infection of the nail unit—includes non-dermatophyte fungi
- Most common of all nail disorders—comprises 50%; 2-8 % of population
- Seen more recently in association with prosthetic nails
- Four clinical subtypes
  - Distal subungual
  - Proximal subungual
  - White superficial
  - Candidal

Dermatophytoses: Onychomycosis

- T. rubrum associated with over 70% of cases; yeast species only 5%; molds can also cause
- Increasing frequency may be associated with increased immunosuppression
- Distal Subungual
  - Clinically, white to brown-yellow discoloration of nail distally to proximally
  - Subungual hyperkeratosis
  - Marked dystrophy

Dermatophytoses: Onychomycosis

- Proximal Superficial
  - White to beige opacity of proximal nail fold
  - *T. rubrum* and *T megninii*
  - Can enlargen to affect the entire nail
  - *T. rubrum* variant seen almost exclusively in HIV setting
- White Superficial
  - Direct invasion of dorsal nail plate
  - White to yellow discoloration, patchy
- Candidal
  - Invade via hyponychia
  - Destruction of entire nail plate

Differential Diagnoses

- Tinea corporis and related
  - Almost any papulosquamous disorder
    - Seborrhea, atopic dermatitis, psoriasis, pityriases, t-cell lymphomas
    - Other infections, drug eruptions
- Tinea capitis
  - Seborrhea/psoriasis
  - Inflammatory alopecias; trauma
  - Bacterial infections
- Onychomycoses
  - Lichen planus, psoriasis, mechanical, drug

Dermatophytoses: Treatment

- Systemic versus topical
- Hair, nails almost always require oral therapies
- Griseofulvin remains a standard secondary to FDA approval and cost
  - Need 6- 8 weeks of therapy; should be taken with a fatty meal
  - Side effects include photosensitivity, gastrointestinal
- Azole antifungals: Ketoconazole/fluconazole/itraconazole
  - Hepatitis; lesser effect on gastrointestinal, drug-drug
- Allylamine antifungals: Terbenafine
  - Hepatits, gastrointestinal, drug-drug

Dermatophytoses: Treatment

- Topical therapies
  - A variety exist
    - Imidazoles, allylamines, tolnaftate, cicloprox, butenafine
    - Shampoos as adjuvant therapies—i.e. selenium sulfide based
- Treat secondary infections
- Site and nature of infection dictate therapy
- Increasing resistance seen
- Avoidance techniques

Yeast Infections

- Candidiasis
  - Most *Candidal* species do not infect humans and are only opportunistic infections
  - Share the ability to produce pseudomycelia with the exception of *C. glabrata*
  - *C. albicans* responsible for 70-80% of all infections
- Pityriasis versicolor
  - Malassezia genus— *M. Furfur* (or *Pityrosporum furfur*) causative

Yeast Infections

- Candidal
- Widespread
  - Oral, vaginal, male genitalia, cutaneous all exist
  - Disseminated and mucocutaneous in immunocompromised setting—chemotherapy, primary cell mediated immunodeficiencies
- Clinical picture varies from discreet white patches on mucosa to erythema with satellite pustules to erosions
- Treatment dependent on co-morbidities; disease extent
- Disseminated will require aggessive treatment—amphotericin B or caspofungin

Yeast Infections

- Tinea versicolor
  - Classic presentation of brown, nominally scaly papules and plaques of chest/back/trunk
  - Hypopigmentation through azelaic acid by-product—hence the “varied color”
  - “Spaghetti and meatballs” of spores and hyphae on KOH prep
  - Differential includes papulosquamous disorders, vitiligo, syphilis
  - Oral or topical treatment on severity—azole antifungals effective orally